

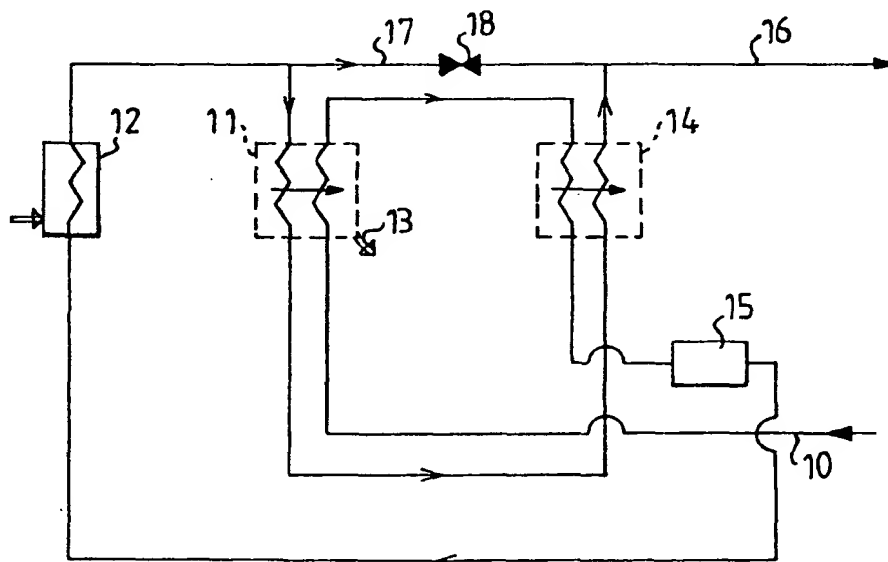


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(21) International Application Number: PCT/SE94/00990 (22) International Filing Date: 20 October 1994 (20.10.94) (30) Priority Data: 9303645-7 5 November 1993 (05.11.93) SE (71) Applicant (for all designated States except US): SUNDS DEFIBRATOR INDUSTRIES AB [SE/SE]; S-851 94 Sundsvall (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): SÄFSTRÖM, Christer [SE/SE]; Utviksbacken 26, S-117 47 Stockholm (SE). LUNDGREN, Göran [SE/SE]; Metkroksvägen 2, S-865 91 Alnö (SE). (74) Agent: SUNDQVIST, Hans; Sunds Defibrator Industries AB, Strandbergsgatan 61, S-112 51 Stockholm (SE).		(81) Designated States: AU, CA, FI, JP, NZ, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: METHOD OF PURIFYING WASTE WATER**(57) Abstract**

A method of purifying and recovering waste water from a fiberboard manufacturing process. The waste water is supplied to an evaporator (11), in which steam from a steam generator (12) is used as heating medium for evaporating the waste water and concentrating impurities. These impurities are thereafter separated mechanically from the evaporator (11). The steam generated in the evaporator (11) is used in a steam converter (14) for restoring the heating medium used in the evaporator (11) from condensate to steam phase. The condensate formed in the steam converter (14) is purified from solved substances in a purifying unit (15). The condensate thus purified is used as feed water in the steam generator (12), from which steam is supplied to the evaporator (11).



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Method of purifying waste water

This invention relates to a method of purifying and recovering waste water from a fiberboard manufacturing process.

At the manufacture of fiberboard according to the dry method, for example MDF (Medium Density Fiberboard), the starting material is lignocellulose-containing fiber material, for example wood chips which are washed, defibered, dried, glued, formed to a fiber mat and pressed in a hot press.

At this process a large amount of waste water is produced, which was separated from the fiber material, for example at chip washing, dewatering screw, gas scrubber a.o. This waste water contains impurities in the form of fiber fragments and other organic matter.

For purifying waste water, an evaporator can be used which concentrates the impurities by evaporation of the waste water. The impurities can thereafter be separated mechanically from the evaporator. The waste water thus purified partially could be re-used in the process, while a large proportion was emitted. The requirements on the purity of waste water have become increasingly severe and, therefore, the purification costs have increased and thereby have deteriorated the profitability of the entire fiberboard manufacturing process.

The present invention offers a solution of the aforesaid problem by using the contaminated waste water after purification for steam generation.

The characterizing features of the invention are apparent from the attached claims!

The invention is described in greater detail in the following, with reference to the accompanying Figure, which by way of a flow chart illustrates an embodiment of the method according to the invention.

Contaminated waste water from chip washing, press water from the feed screw to the defibering process and scrubber water from the fiber drier is fed through a supply line 10 to an evaporator 11. This evaporator is designed as a heat exchanger where heating medium in the form of steam of high pressure is directed in a counterflow. The steam used as heating medium is generated in a steam generator 12 and can have a pressure of 12-25 bar, suitably about 16 bar.

In the evaporator 11 the waste water is evaporated and at the same time the heating steam is condensed whereby the impurities are concentrated and mechanically separated. These impurities are discharged from the evaporator 11 through an outlet 13 in the form of a thickened sludge, the dry matter content of which is sufficient for yielding a positive heat value, which makes its combustion, for example in a roasting boiler, possible.

The waste water evaporated in the evaporator 11 is directed to a steam converter 14, which is designed as a heat exchanger where the evaporated waste water in a counterflow heats the condensate from the evaporator 11, so that it is restored to steam at the same time as the evaporated waste water is condensed. This condensed waste water, which still contains water-soluble impurities, is directed to a purification unit 15 where these solved substances are separated, for example by inverted osmosis. The waste water is purified by this treatment to such a quality, that it can be used as feed water in the steam generator 12.

The steam generated in the steam converter 14 is discharged through a line 16 for being used as consumption steam in the fiberboard manufacturing process. The steam pressure is slightly lower than the steam pressure from the steam generator 12. The outgoing steam pressure, thus, can be 10-20 bar. At a steam pressure of about 16 bar after the steam generator 12, the steam pressure after the steam converter can be about 12 bar. Part of the steam generated in the steam generator 12 is returned via a passageway 17 with a reducing valve 18 directly to the process, together with the steam

in the line 16 generated in the steam converter 14.

The evaporator 11 as well as the steam converter 14 preferably are designed so that in operation contaminated heating surfaces are continuously cleaned mechanically.

The waste water amounts obtained in the process which is supplied through the line 10, normally is of the same magnitude as the demand of feed water for generating steam in the steam generator 12. When the supplied amount of waste water substantially corresponds to the demand of feed water for generating consumption steam, in the entire system for purifying and recovering waste water balance is obtained.

The invention, of course, is not restricted to the embodiment described and shown, but can be varied within the scope of the invention idea.

Claims

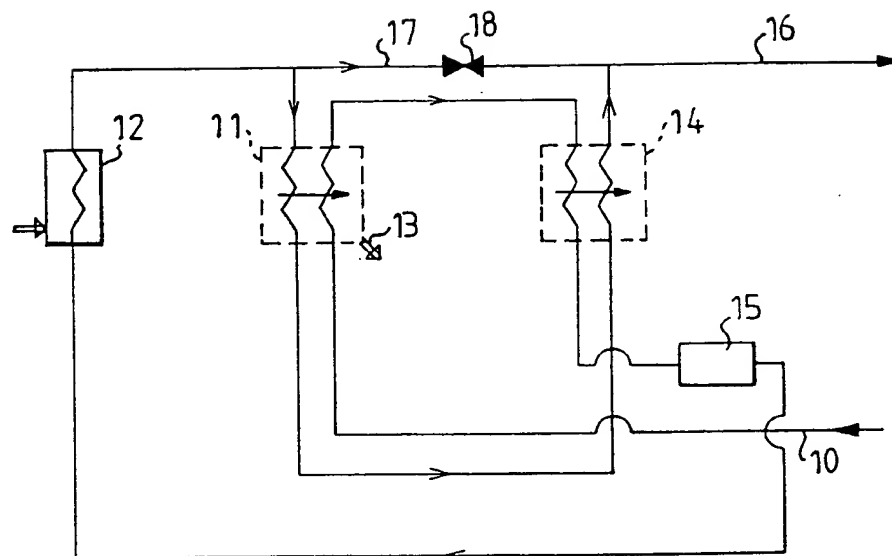
1. A method of purifying and recovering waste water from a fiber-board manufacturing process, where the waste water is supplied to an evaporator (11), in which steam from a steam generator (12) is used as heating medium for evaporating the waste water and concentrating impurities, which thereafter are separated mechanically from the evaporator (11), characterized in that the steam generated in the evaporator (11) is used in a steam converter (14) for restoring the heating medium used in the evaporator (11) from condensate to steam phase, that the condensate formed in the steam converter (14) is purified in a purification unit (15) from solved substances, whereafter the condensate thus purified is used as feed water in the steam generator (12), from which steam is supplied to the evaporator (11).

2. A method as defined in claim 1, characterized in that the condensate restored in the steam converter (14) to steam phase is used as consumption steam in the process.

3. A method as defined in claim 1 or 2, characterized in that part of the steam generated in the steam generator (12) is used directly as consumption steam in the process.

4. A method as defined in any one of the preceding claims, characterized in that the supplied amount of waste water substantially corresponds to the demand of feed water for generating consumption steam in the process.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 94/00990

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: C02F 1/10, D21F 1/66 // B01D 1/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B01D, C02F, D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim
X	US, A, 3242970 (H. SCHMOLE), 29 March 1966 (29.03.66), column 5, line 21 - column 6, line 32, figure 4 --	1
A	WO, A1, 9316004 (SCHIESTL, ADOLF), 19 August 1993 (19.08.93), page 2, line 26 - page 3, line 20, figure 1 --	1
A	WO, A1, 9013342 (INVENTIO OY), 15 November 1990 (15.11.90), figure 1, claims 1-3 --	1

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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PCT/SE 94/00990

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4379734 (PAUL FRANZEN), 12 April 1983 (12.04.83), column 7, line 44 - column 8, line 32, figure 1 -----	1

INTERNATIONAL SEARCH REPORT
Information on patent family members

31/12/94

International application No.
PCT/SE 94/00990

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US-A-	3242970	29/03/66	NONE		
WO-A1-	9316004	19/08/93	AT-B-	397078	25/01/94
			AU-A-	3337393	03/09/93
WO-A1-	9013342	15/11/90	EP-A-	0491696	01/07/92
US-A-	4379734	12/04/83	CA-A-	1175338	02/10/84
			DE-A,C-	3016406	05/11/81
			FR-A-	2481137	30/10/81
			GB-A,B-	2074463	04/11/81
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